Assignment 1

● Graded

Group

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View or edit group

Total Points

73 / 85 pts

Question 1

a) **14** / 15 pts

- **– 0 pts** Correct
- **– 5 pts** No query result
- **– 10 pts** Wrong expression
- **– 3 pts** missing 2 rows in the output
- **– 3 pts** Slightly wrong expression
- **– 3 pts** Slightly incorrect query result
- **– 1 pt** Slightly wrong in expression

✔ **– 1 pt** only need to return model number

Question 2

b) **15** / 15 pts

✔ **– 0 pts** Correct

- **– 5 pts** No query result
- **– 10 pts** Wrong expression
- **– 3 pts** Incorrect Query Result
- **– 2 pts** Slightly wrong expression
- **– 1 pt** Include more than one column in query result
- **– 1 pt** missing entries for query result
- **– 1 pt** minor mistake in expression

Question 3

c) **10** / 15 pts

- **– 0 pts** Correct
- **– 5 pts** No query result
- **– 10 pts** Wrong expression
- **– 3 pts** Incorrect Query Result
- **– 1 pt** slightly wrong expression.

✔ **– 5 pts** Slightly wrong expression

1 eempty set

Question 4

d) **15** / 15 pts

✔ **– 0 pts** Correct

- **– 2 pts** No projection to get model column
- **– 2 pts** Incorrect query
- **– 2 pts** Incorrect query results
- **– 5 pts** No query result
- **– 10 pts** Wrong expression

Question 5

e) **9** / 15 pts

- **– 0 pts** Correct
- **– 3 pts** Incorrect projection

✔ **– 3 pts** Incorrect query

✔ **– 3 pts** Incorrect query results

- **– 2 pts** Incorrect tables used
- **– 5 pts** No query result
- **– 5 pts** No projection
- **– 10 pts** Wrong expression

Question 6

Exercise 2.4.5

10 / 10 pts

✔ **– 0 pts** Correct

– 3 pts Theta join does not remove columns

– 5 pts Incorrect

– 10 pts No answer

– 1 pt minor error

– 3 pts minor II

No questions assigned to the following page.

CS3425 Assignment 1

DBMS, relation model and basic algebra query.

There are total of 6 questions. Please start a new page for each question. When you upload your submission to grade scope, please carefully mark the correct page(s) for each question. Failure to mark pages correctly will subject to 10% penalty for related question.

For EACH problem of Q1-Q5 , you will need to do TWO things:

1) (10p) Write expression of relational algebra in ONE of the three notations a) Complex expression [See example in the middle of the page 48] b) Linear expression [See example in Section 2.4.13 on page 51] c) Expression tree [See example of Figure 2.18 on page 48]
2) (5p) Show the query results for the sample data. [See result example in Figure 2.14 (c) on page 44]

2.4

Exercise 2.4.1: This exercise builds upon the products schema of Exercise 2.3.1. Recall that the database schema consists of four relations, whose schemas are:

Product(maker, model, type)
PC(model, speed, ram, hd, price)
Laptop(model, speed, ram, hd, screen, price)
Printer(model, color, type, price)

Some sample data for the relation Product is shown in Fig. 2.20. Sample data for the other three relations is shown in Fig. 2.21. Manufacturers and model numbers have been "sanitized," but the data is typical of products on sale at the beginning of 2007.

Write expressions of relational algebra to answer the following queries. You may use the linear notation of Section 2.4.13 if you wish. For the data of Figs. 2.20 and 2.21, show the result of your query. However, your answer should work for arbitrary data, not just the data of these figures.

Question assigned to the following page: 1

1. (15 points) (Text Book Page 52) Exercise 2.4.1 a)
What PC models have a speed of at least 3.00?

a)$\sigma_{speed>=3.00}PC$

b)

model	speed	ram	hd	price
1005	3.20	512	250	630
1006	3.20	1024	320	1049
1013	3.06	512	80	529

Question assigned to the following page: 2

2. (15 points) (Text Book Page 52) Exercise 2.4.1
b) Hint: Use join
Which manufacturers make laptops with a hard disk of at least 100GB?

a) π maker (σ hd >= 100 (Laptop))

b)

maker
A
B
E
F
G

Question assigned to the following page: 3

3. (15 points) (Text Book Page 52) Exercise 2.4.1
c) Hint: Use union
Find the model number and price of all products (of any type) made by manufacturer B.

a) π model, price (σ maker = 'B' (Product ⋈ PC ⋈ Laptop ⋈ Printer))

This is what I found online:
π(model, price) (σ(maker='B') Product

b)

model	price
1004	649
1005	630
1006	1049
2007	1429

Question assigned to the following page: 4

4. (15 points) (Text Book Page 52) Exercise 2.4.1 d)
Find the model numbers of all color laser printers.

a) $\pi_{model}(\sigma_{color=true\&type=laser}Printer)$

b)

model
3003
3007

Question assigned to the following page: 5

5. (15 points) (Text Book Page 52) Exercise 2.4.1

e)

Find those manufacturers that sell Laptops, but not PC's.

a) $\pi_{makers}(\sigma_{type=!pc \ \& \ type=laptop}Product)$

b)

b)

maker
e
f
g

Question assigned to the following page: 6

6. (10p) Exercise 2.4.5 on page 57.

What is the difference between the natural join R t><l S and the theta-join R t><l c S where the condition C is that R.A = S.A for each attribute A appearing in the schemas of both R and S?

Hint: Think about the result data AND schema.

The natural join (⋈) combines tables by matching rows with equal values in attributes of the same name, resulting in a simplified schema with only one copy of each common attribute. In contrast, the theta-join (⋈) allows for more flexible conditions when combining tables, even if attributes have different names, and includes all attributes from both tables in the result schema. The key difference lies in the condition: natural join relies on attribute name equality, while theta-join allows for custom conditions. In your specific case, where R.A = S.A for all shared attributes, it essentially behaves like a natural join.

Appendment: CS3425 Relational Algebra Symbols

Unary Operators

Selection : σ

Example: $\sigma_{gpa>3.7}$Student

Projection: π

Example: $\pi_{sId,name}$Student

Renaming: ρ

Example: $\rho_{s1(id,stuname)}$ Student

Binary Operators:

Cartesian Product: ×

Example: student × Apply

Natural Join: ⋈

Example: student ⋈ Apply

No questions assigned to the following page.

Union: ∪ or ∪

Example: π_{name}Student ∪ π_{name}Instructor

Intersection: ∩ or ∩

Example: π_{name}Student ∩ π_{name}Instructor

Difference: —or –

Example: π_{name}Student – π_{name}Instructor

Logic Symbols

Logical AND ∧ or and

Example: $\sigma_{gpa>3.7 \wedge major='cs'}$Student $\sigma_{gpa>3.7 \text{ and } major='cs'}$Student

Logical OR ∨ or or

Example: $\sigma_{gpa>3.7 \vee major='cs'}$Student $\sigma_{gpa>3.7 \text{ or } major='cs'}$Student

Logical NOT ← or not

Example: $\sigma_{\leftarrow (major='cs')}$Student $\sigma_{not\ (major='cs')}$Student

$\sigma_{major!='cs'}$Student